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EXAMINER

EDWARDS, PATRICK L

ART UNIT PAPER NUMBER

2621

DATE MAILED: 07/02/2004

16

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/592,285

Applicant(s)

UTAGAWA, KEN

Examiner

Patrick L Edwards

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on 20 April 2004.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-13, 15, 16, 19, 21 and 22 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 2 and 3 is/are allowed.
- 6) ☒ Claim(s) 1, 4-13, 15, 16, 19, 21 and 22 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 14.
- 4) ☒ Interview Summary (PTO-413)
Paper No(s)/Mail Date. 15.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

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DETAILED ACTION

1. The response received on April 20, 2004 has been placed in the file and was considered by the examiner. An action on the merits follows.

Response to Arguments

2. The applicant's arguments filed April 20, 2004 have been fully considered. A response to these arguments is provided below.

Specification Objections

Summary of Argument: The specification was initially objected to (page 1 lines 4-10 of the applicant's specification) as a result of improper incorporations by reference. The applicant has amended the specification by deleting the paragraph on page 1 lines 4-10 which contained the improper incorporations.

Examiner's Response: The applicant has deleted the aforesaid paragraph which contained improper incorporations by reference. Consequently, the original objection to the specification is now moot and is hereby withdrawn.

Claim Rejections – 35 USC § 112

Summary of Argument: Claim 6 was originally rejected under 35 U.S.C 112, second paragraph as being indefinite because of an inconsistency with the parent claim (claim 4). Claims 7 and 8 were rejected because they were dependent on an indefinite claim. The applicant has amended claim 6 to depend from claim 1, instead of claim 4. The applicant asserts that this amendment eliminates any prior claim indefiniteness.

Examiner's Response: The examiner is persuaded that the amendment to claim 6 has cleared up the previous 112 issue. However, the amendment has created a new 112 2nd paragraph issue which will be discussed in the rejection below. Consequently, claims 6-8 are still rejected under 35 U.S.C 112, second paragraph.

Claim Rejections – 35 USC § 102

Summary of Argument: Claims 1, 2, 14, 17 and 19-21 were originally rejected under 35 USC § 102(b) as being anticipated by US Patent No. 5,771,318 issued to Fang et al.

Claims 14, 17 and 20 have been cancelled and their prior rejections are now moot.

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The applicant has amended claim 1 and argues that this amendment overcomes the prior art rejection. More specifically, the applicant argues that the Fang reference fails to disclose an image processing method where similarity is judged by using characteristic differences among a plurality of pixels located on lines passing through the target pixel along specific directions, and passing near the target pixel along specific directions.

Amended claim 2 is now independent. It contains some of the limitations from the original claim 3. The applicant argues that the Fang reference fails to disclose several of the features of the amended claim and asserts that the claim is now allowable over the prior art.

The applicant has also amended claims 13 and 19, both of which are now in independent form. The applicant that the Fang reference fails to disclose several of the features of the amended claims and asserts the the new claims are now allowable over the prior art.

Examiner's Response: With regard to claims 1, 13 and 19, the applicant's arguments have been considered but are moot in view of the new grounds of rejection necessitated by amendment. The new grounds of rejection are provided below.

With regard to claim 2, the applicant's amendments to the claim and subsequent arguments regarding the amendment have been considered and are persuasive. Claim 2 and its dependent claim are allowable over the prior art.

Claim Rejections – 35 USC § 103

Summary of Argument: The applicant argues that the prior 103 rejections should be withdrawn because none of the reference combinations disclose the limitations of the newly amended independent claims 1, 2, 13 and 19. The applicant argues that the claims which depend from these claims are allowable as well.

Examiner's Response: The applicant's arguments with respect to claims 4-12, 15-16 and 21 have been considered but are moot in view of the new grounds of rejection necessitated by amendment.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

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The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claims 6-8, 13, 15-16, 19 and 21-22 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

With regard to claim 6, the phrase "said first similarity values" recited in the claim lacks antecedent basis. Claim 6 depends back from claim 1, which makes no mention of a "first similarity value" or even a "similarity value".

Claims 7 and 8 are rejected as being dependent on an indefinite claim.

With regard to claims 13 and 19, the metes and bounds of the phrase "a weighting rate to said first color is high" are indefinite as recited in the claim. After reading this phrase it isn't clear what a 'weighting rate to said first color' is referring to, or why it would be high or low? Is this weighting rate high in relation to something else? Which weighting rates qualify as high and which weighting rates qualify as low? This phrase could be interpreted to mean that the weighting rates are largely determined by one color, or it could mean that one color of an image receives more weight than another color in the subsequent weighted averaging operation, or it could mean something else entirely.

Claims 15-16 and 21-22 are rejected as being dependent on an indefinite claim.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claim 1 is rejected under 35 U.S.C. 103(a) as being unpatentable over Fang et al. (USPN 5,771,318) in view of Asimopoulos et al. (USPN 6,195,467).

With regard to claim 1, Fang discloses a similarity judging step in which similarity among pixels are judged along four directions in a local area containing a target pixel undergoing low-pass filtering (column 3 line 63 – column 4 line 25). The calculation of the local directional variances as disclosed in Fang is analogous to the similarity judgment recited in the claims in that it judges similarity among pixels along at least four directions in a local area containing a target pixel $y(i,j)$ undergoing low-pass filtering.

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Fang further discloses a direction-dependent low-pass filtering step of performing a weighted averaging operation in which weighted pixel values of pixels around a target pixel are added to a pixel value of said target pixel and a result of said addition is divided by the sum of the weights (column 4 lines 35-50). Fang further discloses a weighting rate, along a direction manifesting marked similarity, becoming increased based upon the similarity judgment (column 4 lines 43-55).

Fang further discloses that similarity is judged by using characteristic differences (i.e. directional variances) among a plurality of pixels located on lines passing through the target pixel along specific directions (column 4 lines 33-37 in conjunction with Figure 1), but fails to expressly disclose that similarity is also judged using characteristic differences of pixels located on lines passing near the target pixel along specific directions.

Asimopoulos, however, discloses using characteristic differences among a plurality of pixels located on lines passing through said target pixel along specific directions and characteristic differences among a plurality of pixels located on lines passing near the target pixel along specific directions (Asimopoulos Figure 6 in conjunction with col. 13 line 50 – col. 14 line 63). It would have been obvious to one reasonably skilled in the art at the time of the invention to modify Fang's low-pass filtering method by having the similarity judging step utilize characteristic differences between pixels passing through the target pixel and near the target pixel as taught by Asimopoulos. Such a modification would have allowed for a more robust detection of image edges (Asimopoulos col. 14 lines 2-5) which would have allowed for a more accurate enhancement of the target pixel (Asimopoulos col. 13 lines 65-66).

7. Claims 13, 15-16, 19 and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fang in view of Okisu (USPN 6,091,862).

With regard to claim 13, Fang discloses a method for low-pass filtering image data which comprises a similarity judging step and a direction-dependent low-pass filtering step (see the above argument with respect to claim 1). Fang fails to expressly disclose that the image data has values regarding a first color and values regarding a second color or a color difference between said second color and said first color. It follows that Fang also fails to expressly disclose that weighting rates are obtained based upon said first color and/or luminance values in which a weighting to said first color is high and weighted averaging is performed for said second color or said color difference using said weighting rates in said direction-dependent low-pass filtering step.

Okisu, however, discloses that the image data has values regarding a first color and a second color (Okisu col. 4 lines 18-22). Okisu further discloses obtaining weighting rates based upon a first color in which the weighting to the first color is high (Okisu col. 5 line 63 – col. 6 line 7). The weighting rates (i.e. the 'weight of the pixel values') disclosed in Okisu are based upon a first color (green). Okisu discloses that the weighting to the first color is high (Okisu col. 1 lines 59-61). The higher sampling frequency disclosed in Okisu is analogous to the claimed 'high weighting to the first color'. Okisu further discloses that weighted averaging is performed for the second color using said weighting rates (Okisu col. 4 lines 25-31). It would have been obvious to one reasonably skilled in the art at the time of the invention to modify Fang's image processing method by adding the capability to process color

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image data as taught by Okisu. Such a modification would have allowed for a more robust system that could process color images as well as gray-scale images.

With regard to claim 19, a computer-readable recording medium that stores a program which causes the computer to execute the steps of a method is essential if the image processing method disclosed in the combination of Fang and Okisu is to function. Therefore, a computer-readable recording medium is inherent in these teachings.

With regard to claim 15, Okisu further discloses that the image data are generated by performing color separation in which reflected light from an object is captured with color filters arranged in a Bayer array (Okisu col. 1 lines 17-23). The limitations recited in the second paragraph of claim 15 have already been addressed with regard to claim 13.

With regard to claim 16, Okisu discloses implementing processing on G color image data, R color image data and B color image data (Okisu col. 4 lines 26-31). Okisu also discloses implementing processing on color difference data (Okisu col. 4 lines 37-63).

With regard to claim 21, Fang discloses a direction-dependent low-pass filtering step with four weighting rates corresponding to four different filter directions. It can be seen in Figure 1 that one of weighting rates is applied for the pixels to the left and right of the target pixel, one of the weighting rates is applied for the pixels above and below the target pixel, one of the weighting rates is applied for the pixel above the target pixel on the right and below the target pixel on the left, and one of the weighting rates is applied for the pixel above the target pixel on the left and below the target pixel on the right. Although Fang does not explicitly state that the target pixel itself has a weighting rate associated with, we can see from Figure 1 that the target pixel is used in the determination of all of the four other weighting rates. As a result, a first weighting rate for the target pixel is inherent in Fang's direction-dependent low-pass filtering step.

8. Claims 4-7 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Fang and Asimopoulos as applied to claim 1 above, and further in view of Shiraishi (USPN 5,253,046). The arguments as to the relevance of Fang and Asimopoulos as applied above are incorporated herein.

With regard to claim 4, the combination of Fang and Asimopoulos discloses a similarity judging step, but fails to expressly disclose that the image data being judged is a color image with at least two types of color information. Shiraishi, however, discloses performing processing on at least two types of color information (Shiraishi column 10 lines 59-61 in conjunction with element 112 of Figure 6). It would have been obvious to one reasonably skilled in the art at the time of the invention to modify Fang and Asimopoulos's similarity judging step by adding color image processing capability as taught by Shiraishi. Such a modification would have made for a more robust system that could do similarity judging and subsequent low-pass filtering on additional types of images.

With regard to claim 5, Shiraishi further discloses that processing is performed on a color image that has yet to undergo interpolation processing (Shiraishi column 23 lines 45-49 in conjunction with Figure 28).

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With regard to claim 6, the combination of Fang and Shiraishi discloses calculating similarity values along specific directions using characteristics differences of color image data. Calculating characteristics differences among a plurality of same color pixels and/or a plurality of different color pixels is inherent in the calculation of the characteristics differences of a color image along specific directions. Therefore, this is inherently taught in the combination of Fang, Asimopoulos and Shiraishi.

With regard to claim 7, Shiraishi further discloses that the image processing is performed on color image data having undergone white balance processing (Shiraishi column 10 lines 55-61 in conjunction with element 111 of Figure 28).

9. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Fang, Asimopoulos and Shiraishi as applied to claim 6 above, and further in view of Ikeda. The arguments as to the relevance of the combination of Fang and Shiraishi as applied in paragraph 6 above are incorporated herein.

The aforesaid combination discloses all of the limitations of claim 8 except that it fails to expressly disclose the step of detecting a degree of saturation of a target pixel in the calculation of characteristics differences of a plurality of color pixels. Ikeda, however, discloses determining a saturated region of a color image in a low-pass filter environment (Ikeda column 3 lines 20-25). It would have been obvious to one reasonably skilled in the art at the time of the invention to modify the image processing method for low-pass filtering a color image as disclosed in the combination of Fang and Shiraishi by detecting a degree of saturation of the color pixels as taught by Ikeda. Such a modification would have allowed for a system in which characteristics differences of color pixels were detected with regard to saturation components of the color pixels in addition to the color components.

10. Claims 9-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Fang and Asimopoulos as applied in claim 1 above, and further in view of Ikeda. The arguments as to the relevance of the aforesaid combination as applied above are incorporated herein.

With regard to claim 9, the combination of Fang and Asimopoulos discloses a direction dependent low-pass filtering processing which is implemented on target pixels of an image data, but fails to expressly disclose that said image data undergoes interpolation processing to interpolate pixels with missing color components. Ikeda, however, discloses a low-pass filter environment in which color interpolation processing is performed (Ikeda column 6 lines 15-22 in conjunction with Figure 5). It would have been obvious to one reasonably skilled in the art at the time of the invention to combine the color image data interpolation processing as taught by Ikeda with Fang and Asimopoulos's method of performing directional dependent low-pass filtering on an image. Such a modification would have allowed for a more robust system that could perform the low-pass filtering operation on color image data that had previously been interpolated.

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With regard to claim 10, Ikeda further discloses limiting pixel values of color pixels by a threshold corresponding to a largest pixel value or a smallest pixel value in a specific area near the corresponding pixel (Ikeda column 9 line 59 – column 10 line 14). It would have been obvious to one reasonably skilled in the art at the time of the invention to combine the limiting of pixel values by using maximum and minimum threshold values as taught by Ikeda with Fang and Asimopoulos's method of performing low-pass filtering on an image. Such a modification would have allowed for interpolation results which did not fall outside the upper and lower boundaries of the pixels in an area.

With regard to claim 11, Ikeda discloses performing interpolation processing on color image data that has yet to undergo low-pass filtering processing (Ikeda column 6 lines 15-19 in conjunction with Figure 5). It is well known in the art that a color image data in which one color (a first color) has a higher pixel density than another color (a second color) will inherently contain vacancies of color information. The steps of calculating a color difference between the first and second color, obtaining an interpolation value based on the difference, and then restoring the second color based on the interpolation are all inherent in the process of performing interpolation processing on color image data. Consequently, the limitations of the claim are inherent in the combination of Fang, Asimopoulos and Ikeda.

11. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Fang, Asimopoulos and Ikeda as applied to claim 11 above, and further in view of Shiraishi. The arguments as to the relevance of the aforesaid combination as applied above are incorporated herein.

With regard to claim 12, Shiraishi further discloses that processing is performed on a color image that has yet to undergo interpolation processing (Shiraishi column 23 lines 45-49 in conjunction with Figure 28). It would have been obvious to one reasonably skilled in the art at the time of the invention to modify the direction dependent method of low-pass filtering a color image disclosed in the combination of Fang, Asimopoulos and Ikeda by including the further limitation of interpolating a color image that has already undergone image processing as taught by Shiraishi. Such a modification would have made for a more robust system that could interpolate the color image either before or after low-pass filtering of the image has been performed.

12. Claim 22 is rejected under 35 U.S.C. 103(a) as being unpatentable over Fang and Okisu as applied to claim 21 above and further in view of well known prior art. Fang discloses the first weighting rate for the target pixel is $(1/2m + 1)$ (Fang column 4 equations 10.1 – 10.4). The summation terms of those four equations, which are multiplied by $(1/2m + 1)$ as disclosed in Fang are analogous to tt , yy , nu , and ns as recited in the claim. The claimed value, k , which represents a predetermined value, is simply 1 in the equations of Fang. Although Fang does not expressly disclose that the terms analogous to claimed terms tt , yy , nu and ns add together to equal 1, this further limitation merely calls for the normalization of the four terms. Normalization is well known in the art (Official

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Notice), and it would have been obvious to a person of ordinary skill in the art at the time of the invention to include the normalization of the four terms. Such a modification would have resulted in more efficient computations.

Allowable Subject Matter

13. Claims 2 and 3 are allowed.

Conclusion

14. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

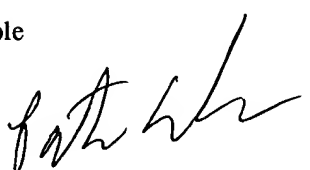
15. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Patrick L Edwards whose telephone number is (703) 305-6301. The examiner can normally be reached on 8:30am - 5:00pm M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Leo Boudreau can be reached on (703) 305-4706. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

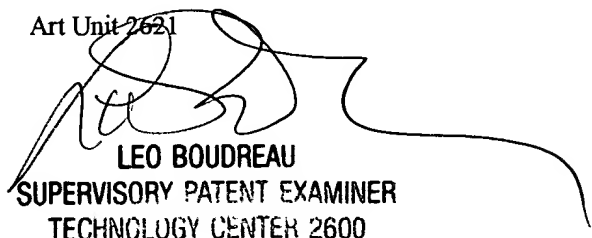
Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Patrick Lynn Edwards

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